In the Application of:

VINAY G. SAKHRANI, ET AL. DOCKET NO.: 5764-001

APPLICATION NO.: 10/791,542 GROUP ART UNIT: 1773

FILED: MARCH 2, 2004 EXAMINER: RAMSEY ZACHARIA

FOR: ARTICLE WITH LUBRICATED SURFACE AND METHOD

DECLARATION OF JEROME J. CUOMO PURSUANT TO 37 C.F.R. § 1.132

I hereby declare as follows:

1. I am the same Jerome J. Cuomo who is the Distinguished Research Professor at North Carolina State University and currently conducts research in the areas using both vacuum (low pressure) and atmospheric (high pressure) plasma technologies.

2. I am a graduate of Odense University, Denmark with a PhD in Physics. I have also been qualified as an expert in plasma technology and given testimony in this area.

3. I am making the following declaration to better describe the differences between low pressure (vacuum) plasma technology and high pressure (atmospheric) plasma technology.

Plasma is a generic term used to describe what is often called "the fourth state of matter" (besides solid, liquid and gas) where a gas has been subjected to enough energy to dissociate electrons from the gas atoms (ionization), producing a cloud of ions, electrons and photons. When the electrons recombine with the ions, the input energy is given off (emitted) in the form of light emissions that are characteristic of the atom or molecule. Plasma characteristics differ according to the gas conditions such as number of atoms or molecules in a given volume (pressure), and the amount of energy needed to cause the atoms to ionize. In and of itself, the word Plasma cannot be used as an all-inclusive term without first taking into account the conditions used to create it, just as using the term HUMAN would not adequately describe the differences in the species making up that group. Similarly the term ENGINE, mechanical devices

having different uses and power requirements, cannot be used as an all inclusive term without taking into account the differences.

The generic term plasmas include outer space glows caused by gases ionized by absorbing ionizing radiation from stars and super novas, to man-made plasmas (commercial plasmas). Commercial low-pressure plasmas (vacuum) are typically activated by DC, RF or microwave energy sources at a pressure range from 0.001 to 300 torr. High-pressure plasmas (atmospheric) operate at about 760 torr at sea level. Specific differences between vacuum plasmas and atmospheric plasmas are: a) the energy needed to cause ionization of the gas, b) the number density of the particles and, c) the temperature of the neutral gas. Therefore, a plasma operated at low pressure (vacuum) differs in characteristics to one operated at high pressure (atmospheric). This is due to how the input energies impact the plasma. These differences are clearly described in a technical paper "The Atmospheric-Pressure Plasma Jet: A Review and Comparison to Other Plasma Sources" IEEE Transactions on Plasma Science, Vol. 26, No. 6, December 1998. The table below summarizes the differences between low pressure (vacuum) and high pressure (atmospheric) plasmas as described in the article.

PROPERTIES	LOW PRESSURE (VACUUM) PLASMAS	HIGH PRESSURE (ATMOSPHERIC PLASMAS)
Breakdown Potential (shown in figure 1 of the review article)	about 1000 volts	10,000 to 30,000 volts
Electron Density	10^{8} to 10^{13} cm^{-3}	10^{16} to 10^{19} cm^{-3}
Electron Temperature Te (energy of the electrons shown in figure 3 of the review article)	$5X10^{4}$ degrees Kelvin	$5X10^{3}$ degrees Kelvin
Temperature of Neutral Molecules (figure 3 of review article)	10^{2} degrees Kelvin	$5X10^{3}$ degrees Kelvin

Another important differentiation between low-pressure (vacuum) plasmas and high-pressure (atmospheric) plasmas is the mean free path. The mean free path is the distance a charged particle can travel before striking another particle causing it to dissipate its energy. At high pressure, there are a significantly higher number of particles for a charged particle to collide with compared to low pressure, causing much of the input energy to be lost before it can be delivered to a surface. ***Thus the input energy delivered to surfaces by low-pressure plasmas is much higher than that by high pressure plasmas***

One with ordinary skill in the art would know the differentiating features between low-pressure and high-pressure plasmas as explained above, and that use of the terminology "exposed to a plasma at any pressure" in U.S. Patent No. 4,822,632 to Williams as cited by the Examiner in the Final Office Action of the above referenced application is all too encompassing. It is clear from the teachings that Williams was operating a low-pressure plasma, therefore the statement "exposed to a plasma at any pressure" would be understood to mean the pressure range known in the art for low-pressure plasmas, that being from 0.001 torr to 300 torr. Extending the meaning to include high-pressure plasmas (at about atmospheric pressure) is unreasonable to one of ordinary skill in the art in light of the differences cited.

4. The undersigned petitioner declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing therefrom.

Jerome J. Cuomo, PhD.

5-13-08

Date